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Recent Advances in Ring-Opening Metathesis Polymerization, and Application to Synthesis of Functional Materials

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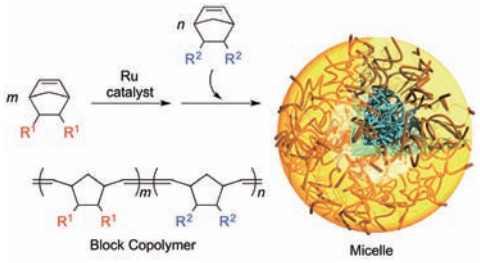
Olefin metathesis reactions are metal-mediated carbon–carbon double bond exchange processes, which were discovered in the mid 1950s. Olefin metathesis polymerization is an application of metathesis reactions to polymer synthesis, including ring-opening metathesis polymerization (ROMP) and acyclic diene metathesis (ADMET) polycondensation. Olefin metathesis polymerization provides a wide range of polymers with unique architectures and useful functions. This article reviews the development of catalysts for ROMP, synthesis of polymers bearing amino acids and peptides by ROMP of functionalized norbornenes, formation of aggregates and micelles, and applications of the polymers to medical materials. It also describes the control of monomer unit sequences, that is, living polymerization to synthesize block copolymers, and alternating copolymerization that is achieved on the basis of acid–base interactions.

Polymer Journal, **42**, 905 (2010)



Versatile Inhibition of Marine Organism Settlement by Zwitterionic Polymer Brushes

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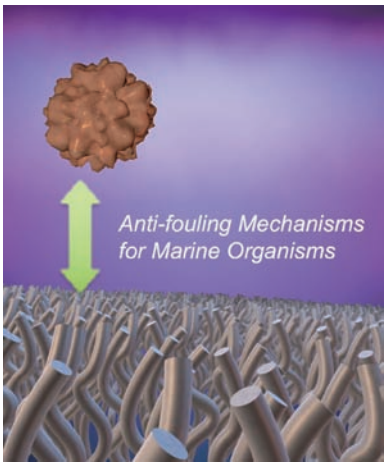
Anti-fouling is a classical but still important issue in industrial products because any cutting-edge functional material surfaces lose the properties through coverage of foreign subjects. Defense systems for marine-fouling are required versatile and long-life performance to reject adhesion of a wide variety of fouling organisms and physical damages. Anti-fouling performance of various polymer brushes for typical marine fouling organisms was investigated to find out the universal principles for anti-marine-fouling polymer interface. We found that the outstanding anti-fouling characters in zwitterionic polyelectrolyte brushes would be attributed to the neutral charge and the hydration state in saline sea water.

Polymer Journal, **47**, 811 (2015)



Design of Biocompatible and Biodegradable Polymers Based on the Intermediate Water Concept

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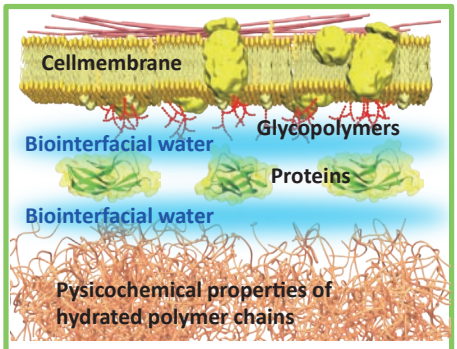
Polymeric biomaterials have significant impact in the aged society. Biocompatible and biodegradable polymers have emerged during the past decades to promise extraordinary breakthroughs in a wide range of diagnostic and therapeutic medical devices. Understanding and controlling the interfacial interactions of the polymeric biomaterials with biological elements, such as water, ions, proteins, bacteria, fungai and cells, are essential toward their successful implementation in biomedical applications. Here we highlight the recent developments of biocompatible and biodegradable fusion polymeric biomaterials for medical devices and provide an overview of the recent progress of the design of the multi-functional biomedical polymers by controlling bio-interfacial water structure through precision polymer synthesis and supramolecular chemistry. Surfaces made of biocompatible and biodegradable polymers profoundly influenced cell behavior.

Polymer Journal, **47**, 114 (2015)
Polymer Journal, **47**, 469 (2015)



Biointerfaces and biointerfacial warer layers:
the intermediate water was only found in hydrated biopolymers and biocompatible synthetic polymers.